STAT 300 Midterm 1 Review Topics

Zepu Zhang
October 25, 2011

Review: lecture notes, examples and exercises mentioned in lecture notes, textbook, homework problems, additional problems in the "problem book".

Bring 4 sheets (8 sides) of notes, prepared by yourself and a calculator.

Statistical tables (for the standard normal cdf) will be provided.

1 Concepts, definitions

- Sample space, events.
- Conditional, independence.
- The transition from "experiments", "outcomes", "events" to "random variables" and "distributions".
- For discrete and continuous, univariate and bivariate: pmf, pdf, cdf, expectation (aka expected value or mean).
- Quantiles.
- For bivariate: marginal, conditional, independence.
- For univariate: variance, standard deviation.
- For bivariate: covariance, correlation.

2 Computations

- Use properties of probability, product rule, combination/permutation, conditional/independence, etc. to calculate probabilities.
- Calculate probabilities about a normal distribution: standard, nonstandard, standardization, table lookup, "critical value z_α".
- Calculate probabilities given a discrete distribution: summation.

- Calculate probabilities given a continuous distribution: integration.
- In integrating a joint pdf, be sure to get the limits right when the domain is not rectangular.
- Univariate: from pdf/pmf to cdf; from cdf to pdf/pmf.
- Bivariate: from joint to marginal and conditional.
- Be able to tell (via calculations) whether the two components in a (discrete or continuous) bivariate distribution are independent.
- Compute mean, variance, covariance, correlation given (joint) distribution.
- Compute mean and variance of a linear combination of other random variables.

3 Specific facts, formulas

- Sample mean, sample variance, sample standard deviation.
- Formulas for combination ("choose"), permutation.
- The "computational formula" connecting (co)variance and mean. (Versions for sample, univariate population, and bivariate population.)
- Binomial: binomial experiment; you should be able to tell whether a binomial distribution applies given the description of the problem; pmf, mean, variance.
- Continuous uniform: pdf, cdf, mean, variance.
- Normal: pdf, mean, variance; you should be able to tell a pdf is normal, and figure out its mean and variance from the formula.
- Exponential: pdf, cdf, "memoryless" property.

4 Plots

Histogram
boxplots, comparative boxplots
normal probability plots (i.e. Q-Q plots):

Be able to create these plots; be able to make some comments and interpretation on the plots (in other words, know what each type of plots is used for); histogram on "density scale".

This exam won't test on these plots.

Venn diagram